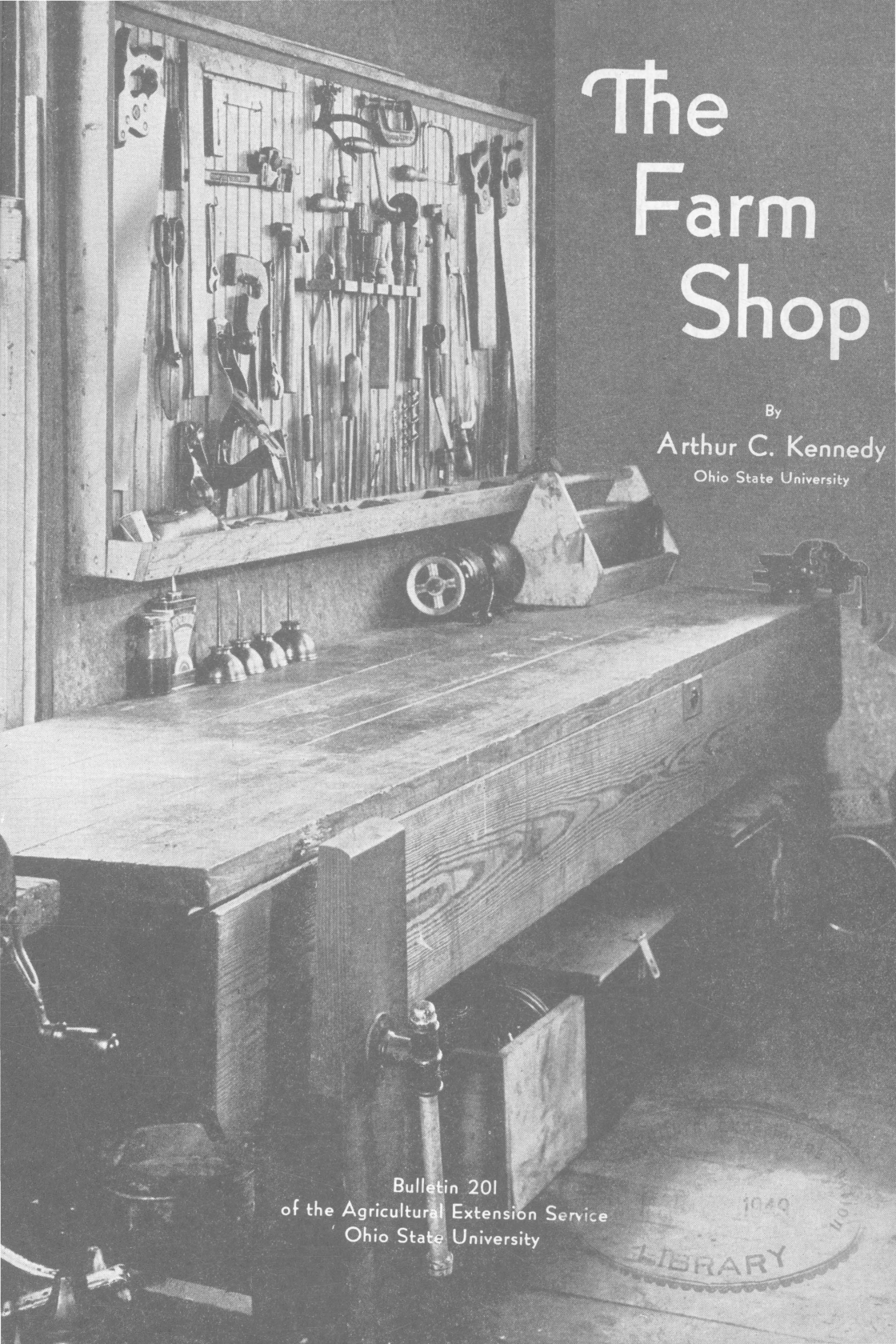

The Farm Shop

By
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Ohio State University

Bulletin 201
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THE FARM SHOP
and Tool Equipment

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FARM BUILDINGS and equipment represent over one-half of the farm investment. In Ohio, our building and equipment investment is appraised at 40 million dollars more than the land itself. Considerable time and money is being expended for the conservation and maintenance of the land, and we all recognize the importance of this program. It would seem logical, then, that we should give considerable time and attention to the maintenance and repair of our buildings and equipment.

It is the aim, in planning and equipping the farm shop, to provide a place and means for doing this needed construction and repair work on the farm. Tools for a shop will pay for themselves in less time than any other farm equipment. It is good management to spend money for shop equipment instead of repairs. Is it not better to prevent breakdowns than to make repairs?

A farm shop is needed on the farm not only because it is possible to make many needed devices cheaper than they can be purchased, but because if you have facilities for making them you will go ahead and do so, while if they have to be bought, you will get along without them. If a shop is available, a profitable use can be made of time that otherwise might not be used. There is no better time for this kind of work than when it is too disagreeable to work outside. The farm shop will afford a means of increasing the life of equipment and buildings by keeping them in good repair. Why, for instance, does the binder on one farm last for a generation while on a neighboring farm it lasts only a few years? It is not the number of acres of grain a binder cuts that determines its life.

Rural economists tell us that the average rate of depreciation on machinery is about 10 per cent; on small farm buildings, about 5 per cent; and on permanent buildings, around 3 per cent. Our problems, as owners or operators of farms, is to lower these percentages and lengthen the life of the buildings and machinery that comprise over one-half of our total farm investment. These rates of depreciation *can* be lowered if we keep the buildings and equipment

in better repair. Of course, we shall need to know how to do this repair work, and also should have a suitable place and the necessary tools for doing it.

A person operating a farm should be skilled in mechanics if he is to make a success of his business. We have long passed the stage when hand labor can be depended upon for the production of farm products. Farmers are using up-to-date machines in sowing and in harvesting their crops; the labor saving qualities of those machines are recognized and appreciated. In order to care for and repair that

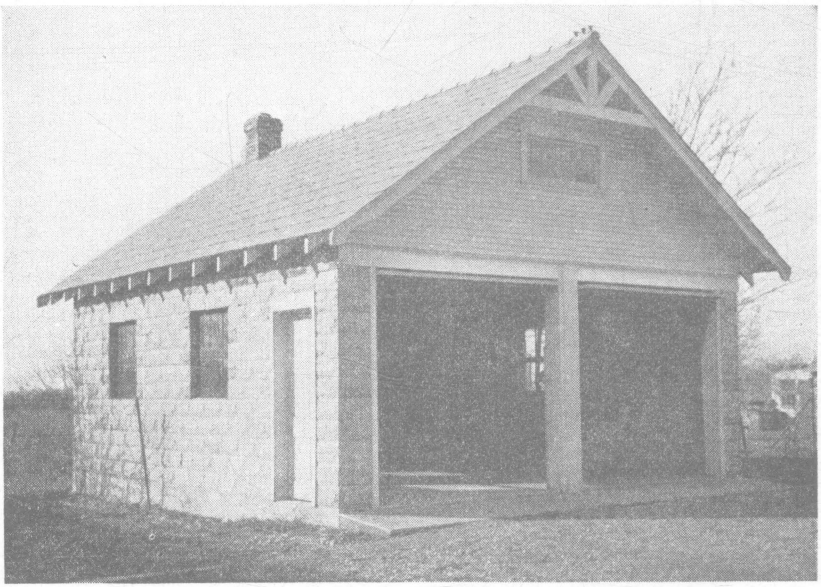

Fig. 1. — The above picture shows the double garage and farm shop combination on the farm of Edward Kientz, of Franklin County, Ohio. When machinery or any piece of equipment is worked on, he uses one side, leaving his truck or automobile outside or in another storage place until the repair work is completed.

machinery properly, it is necessary to have the right tools and a suitable place for doing the work.

There is no better way of attaining a self-satisfied feeling of accomplishment than to put into expression by means of the hands some ideas that have been carefully thought through. Farm shop work will give people with practical ideas an outlet for their energies in creative form. Much of the work done in a farm shop is so interesting that it serves as recreation in comparison with much of the routine farm work. Many people who have much time and little need for shop work resort to it as a hobby. There is probably no

better means of stimulating home and farm interest in the farm boy than by encouraging and assisting him in the development of a home farm shop. These desirable interest and satisfaction factors are of as much importance as the value of the finished products that may be made or repaired in the shop.

Professor J. B. Davidson of the Agricultural Engineering Department of Iowa State College states, in a study entitled Life, Service, and Cost of Service of Farm Machinery, that, "On farms where a well equipped farm shop was provided, the equipment

Fig. 2. — An interior view of the home shop of Ralph Schock, of Franklin County, Ohio. Hardware supplies and paints are kept on hand for use when needed. Ralph shows us one way of sharpening the farm tools.

seemed to be in a high state of repair and the life of the machines was estimated much beyond the average."

The Kentucky Agricultural Experiment Station Bulletin No. 345 makes the following report regarding the value of the farm shop: "The repair shop made possible a savings of $5.47 in expense for each $100 of implement investment, by the use of additional farm labor. This saving was due to the avoidance of much high-priced mechanical labor and the use of farm labor during slack periods of the year. This farm labor amounted to about 46 hours per farm with shops and 15 hours per farm without shops, or a difference of 31 hours."

Shop Work

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Until one has seen a good shop in actual operation for a period of time, its value is not realized. Every farm is constantly in need of repair work on the buildings and the equipment. This repair work is usually not so difficult but that the average person who has some degree of skill in using tools can take care of it. If the farmer has tools and a place for doing the work, he will make these needed repairs at times when the weather is unfit for outside work. In this way the work is done and the time not missed. New construction of feeders, brooder houses, and other small buildings and equipment will result in a cash saving, as well as the satisfaction of having them.

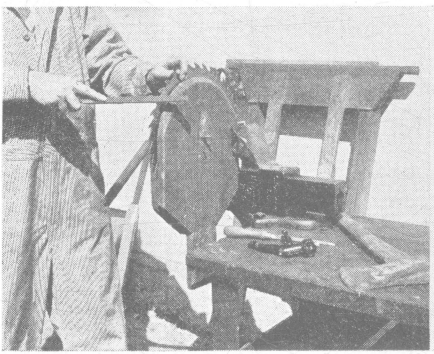

Fig. 3. — A little sharpening goes a long way toward the efficient operation of any saw.

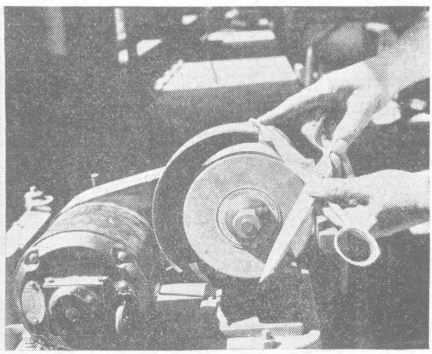

Fig. 4. — Even the scissors are kept sharp by an occasional touching up on the farm grinder.

Tool Sharpening

"A good workman never quarrels with his tools" is a true statement only when that workman keeps his tools in good repair. A tool is in good repair when it is sharp, free from rust, and the handle is in good condition. Space should be provided for a good tool grinder. If electricity is available, a small motor can be attached to the farm grindstone by using a countershaft and reducing pulleys to lower the speed. The average sized grindstone should not turn more than from 60 to 70 revolutions a minute.

If preferred, a small sandstone grinder can be purchased that is designed to be driven with a small motor. The most desirable farm tool grinder is the grinding head, using carborundum stones and operated by a small motor. This grinder is so designed that almost

any farm tool can be sharpened with it. A mowing machine knife grinding wheel, a saw gummer, a wire and a cloth buffer can be used on this grinder. Its cost is not much more than a good grindstone and it will last a lifetime if not abused. A combination carborundum whetstone should be available for finishing the edges of most tools after grinding. A fine and a medium, or a medium and a coarse combination can be purchased. For sharpening some tools a carborundum file is very handy. Sharpening tools is a pleasure with equipment of this kind.

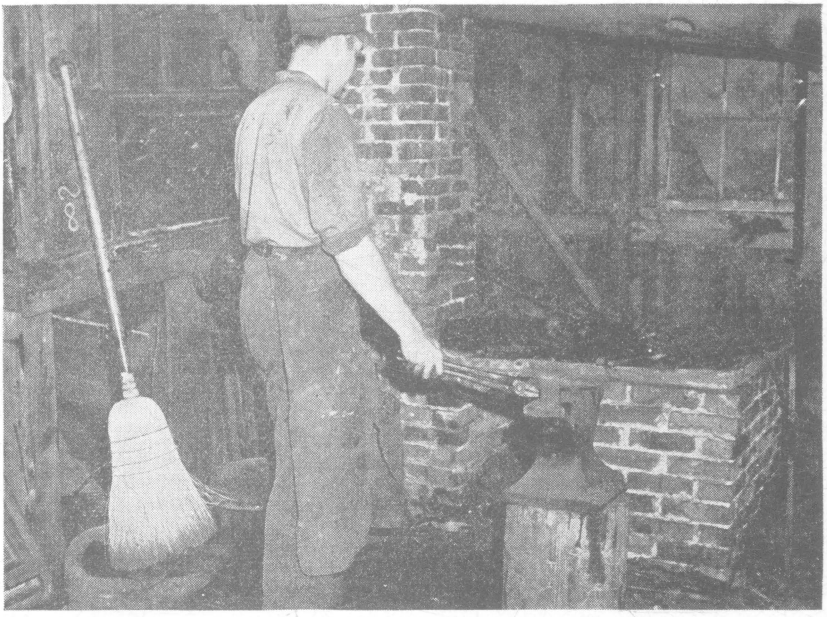

Fig. 5. — The forge in one corner of the shop of Robert Rugg of near Gahanna plays its part in keeping the machinery and other equipment in good repair on the Rugg farm. Many young farmers are providing themselves with shops so that they can do most of this repair work themselves.

Cold and Hot Metal Work

Many repair and new construction jobs involve the use of metal. This may be cold metal work, or it may be necessary to heat the metal. Sheet metal, angle iron, strap iron, round iron, and mild steel are used for the various jobs. Forge work and soldering should be important phases of the farm shop work. Drilling holes and threading rods are jobs that we should be able to do in the farm shop. These types of work can be done satisfactorily by the average workman if he has the tools with which to do them.

Household Mechanics

Almost every household has a kit of tools on top of the kitchen cupboard, in a basket, or in the sewing machine drawer. The housewife makes frequent use of these, and is often obliged to lend them to other members of the household. The need for household repair exists in every home. Much of this needed work should be done in the farm shop. Everything from repairing furniture to sharpening the scissors, and from installing a kitchen sink and cistern pump to repairing the window blind can be done with the shop equipment, if the tools are handy and we are handy with the tools.

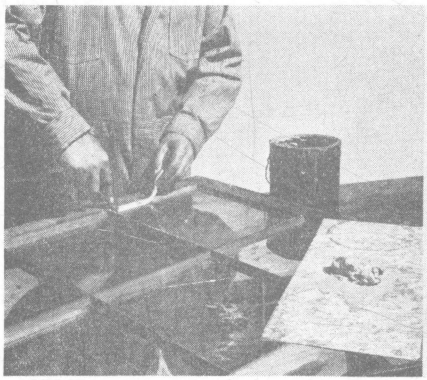

Fig. 6. — A new pane of glass means more light and less draft in the poultry house.

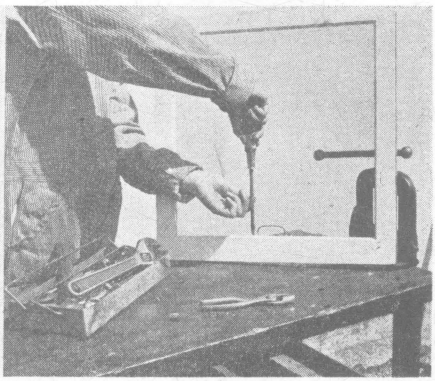

Fig. 7. — A new screen for the kitchen window is being completed.

Painting and Glazing

Another phase of farm repair work that must be given some attention is the replacement of window glass and re-puttying sash where the putty has weathered out. The sash can be taken into the shop and reworked and painted. During the winter months when other work is slack is a good time to bring all small equipment, machinery, and even small portable farm buildings into the shop and give them a coat of paint. The time spent on this type of work will not be missed, but the results will show for a long time, both in appearance and in lasting qualities.

Handle Fitting

Another type of work constantly needing attention is handle fitting. The use of any tool—hatchet, hammer, ax, pick, mattock, chisels of all kinds, or saw—depends to quite an extent on the condition of its handle. This repair work should be done in the shop at a slack time.

Farm Plumbing

If the home and farmstead has running water available, there will be many repair or extension jobs from time to time. Faucets and other plumbing fixtures need to be repaired occasionally. Extension installation can often be made with little effort, and will be found of great convenience. Copper pipe can readily be worked with a minimum of equipment. It is especially useful for doing extension

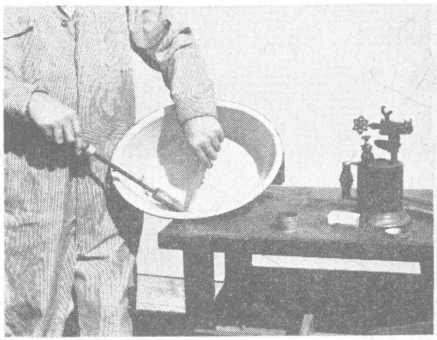

Fig. 8. — The life of much equipment can be doubled by timely use of an ordinary soldering iron.

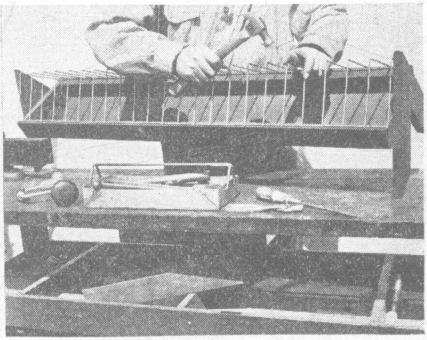

Fig. 9. — Just completing a practical and economical poultry mash feeder. A good job for any rainy day.

or repair work around farm buildings, and its cost, in normal times, is not prohibitive. In fact, copper installation can be made at about the same cost as galvanized pipe, because of the labor saved in the installation of copper in comparison to the labor required for galvanized piping.

Maintenance and Repair of Electrical Equipment

Electricity is a source of the cheapest labor obtainable on the farm. Its convenience for lighting and other uses is recognized. We can best use this source of cheap power by keeping electrical equipment in good repair. Few tools are necessary and the skill required can soon be attained.

Electrical Welding

It is not advisable for the farmer to attempt to do his own welding unless he is mechanically inclined and can secure some instruction on the fundamentals of welding. One must know the qualities of different metals used in machinery construction and the particular type of welding rod to use for each different kind of metal and the kind to use in working two or more metals of different material.

If a farmer has considerable welding to do and has electricity available, he can soon learn to do a good job of welding. Poor welding is a risky method of construction or repair.

If purchasing a welder, it is recommended that a 230-volt, single-phase, 60-cycle, power-factor-correction-type welder be purchased. This will operate from a 3-KVA transformer. A range of from 20 to 180 amperes is a desirable size welder for farm use.

The power company providing the electric service should be consulted before an electric welder is installed.

Machinery Repair and Adjustment

If we have a building large enough, it should have double doors so that farm machinery can be taken into the shop for overhaul and repair work. One machine can be worked on at a time, and during the winter all of the machinery can be worked over. The disks on the disk harrow, for instance, can be sharpened without being removed by jacking one section up at a time so that the disks can be revolved. The power grinder is suspended above the disk and the job is easily and swiftly done. All machinery at some time needs repair work done on it, and if it is done when the machine is not in use, it will be ready for uninterrupted work during the busy season.

Rope Work

Fig. 10. — Short splice.

Often we have jobs in rope that could be done during spare hours, that will be time savers during the busy season. The hay rope may need to be spliced or a strand repaired. We may need more rope halters or tie ropes. Rope ends need whipping or crowns. A shop is a good place in which to do this work, especially if it is heated. See Use of Rope on the Farm, Bul. 82, Extension Service, Ohio State University.

General Repair and Construction

Every farm has more or less general repair and construction work that needs to be done. If the farm has a shop where the work can be done at a time when the farmer is not busy, it is much more apt to *be* done, and this will result in more efficiency and a greater satisfaction in one's work as a whole.

General Requirements of a Farm Shop

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A Convenient Location

The location of the farm repair shop is of little importance provided it is always available, and is of a proper size for the work for which it is to be used. If the mechanical equipment of the farm can be taken into the shop to be overhauled and repaired, broken parts replaced, and adjustments made, it does not matter whether it is a separate building or part of another building.

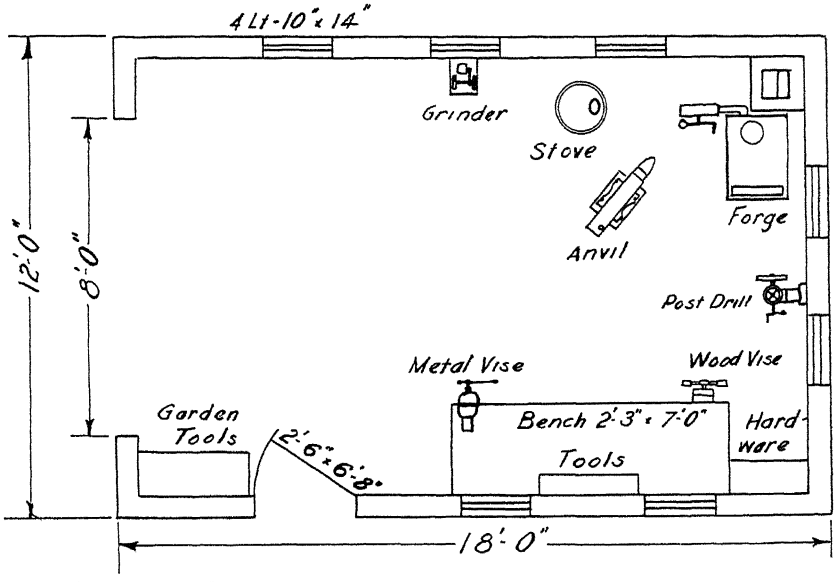
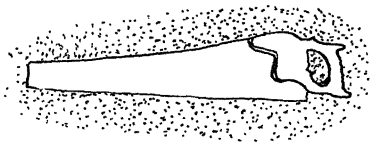


Fig. 11. — The above drawing represents a suitable sized room and placement of the tools and equipment, also the location of doors and windows. The floor plan shows a good farm shop layout. The plan in general could be adapted to almost any room that might be available on the farm.

Size of Shop Important

The size of the shop depends on its use. A shop for the average size farm should not be smaller than 10 feet in width and 18 feet in length. The value of the shop is in direct proportion to its size, arrangement, and equipment. The size will vary, however, according to the amount of equipment and the extent to which the shop is used. The shop space should be large enough to take care of expansion of this type of work, as farmers usually find they need more shop room, rather than less, as time goes by.

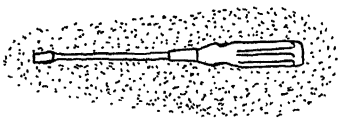
If machinery is to be repaired in the shop, then we shall need to make it large enough to get at least one machine on the floor at a time. This would also mean installing a door wide enough to allow the machinery to pass through. This is desirable, whenever possible, as often we may want to construct some large piece of equipment that would require double doors. Such jobs may be a hog house, two-wheel trailer, a set of hay ladders, or a large self feeder for hogs.



It is not necessary to have a separate building for the shop; often, a space can be provided in one of the other farm buildings. The garage may be large enough to allow room for a work bench, a tool storage space, and floor area sufficient for doing the desired work. Other possible locations are in the granary, barn, machinery storage shed, or some other farm building.

It is often desirable to have a small building that can be used for various purposes. One end might be used as a general storage room; another part as washroom, smoke house, or wood house; and another section for a shop. This arrangement is convenient also from the standpoint of centralizing the use of electric power equipment in case electricity is available.

If the shop is to be a separate building, it could be either a gable or shed roof type building. It is desirable, wherever possible, to have some storage room overhead. With a gable roof type it is possible to have windows in the ends of the gables to provide some light in the storage space. Steps may be constructed in such a way that they can be swung up out of the way when not needed. The shop should have a wood or insulated concrete floor.



Heating the Shop

It is essential that some provision be made for heating the shop, as it will be used most during inclement weather, when it is unsatisfactory to work outside. Either a coal or a wood stove can be used for heating the shop. The refuse material around the building can be used as fuel and thus reduce the cost of heating. Precautions should be taken to avoid any danger of fire in the shop. A square of sheet metal should be placed under the stove as a safeguard against fire, if the shop has a wood floor.

Shop Equipment

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The equipment for the farm repair shop need not be extensive or elaborate. A few well chosen tools will take care of the bulk of the work needed to be done.

Work Bench

The work bench is the first essential piece of equipment needed in the shop. A good bench similar to the one shown in the sketch (Figure 12) can be made for from $5 to $6. The bench should be strong, and should have both a woodworking and a machine vise. The length of the bench would vary according to the space available for it, but it should be 6 to 8 feet long, if possible.

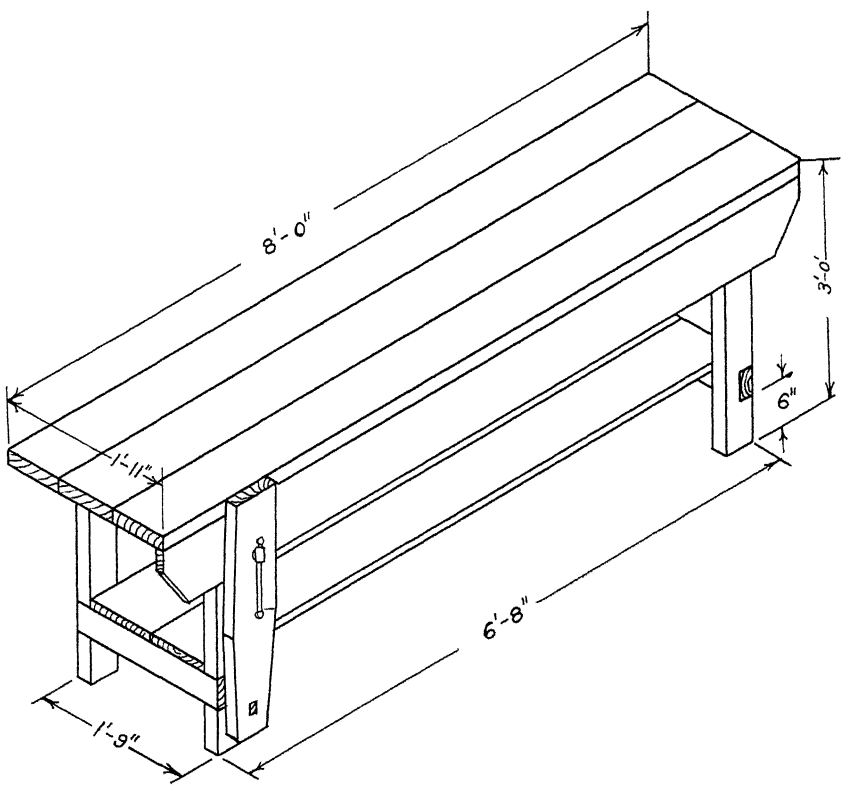
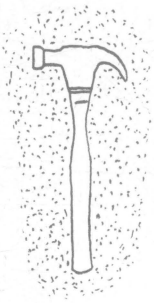
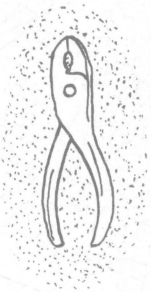


Fig. 12. — A sketch showing the construction of a good farm shop work bench. This bench costs about $6.00 to construct if good yellow pine material is used.



Bill of Materials for Work Bench

Pieces	Name	Size
4	Legs	2″ x 6″ x 2′-8″
4	End rail	2″ x 6″ x 1′-9″
1	Leg brace	2″ x 6″ x 6′-4″
2	Side apron	1″ x 10″ x 8′-0″
3	Top	2″ x 8″ x 8′-0″
8	Carriage bolts	⅜″ x 3″
16	Carriage bolts	⅜″ x 6½″
4	Lag screws	⅜″ x 4½″



Tools

The hand tools in a shop should consist of as few tools as possible, but they should be carefully chosen. The selection should be varied as to types, so that all the different phases of repair and construction work on the farm can be done. The woodworking tools should be kept down to a minimum in number, as often we find too many of these tools in a shop and too few other type tools. The

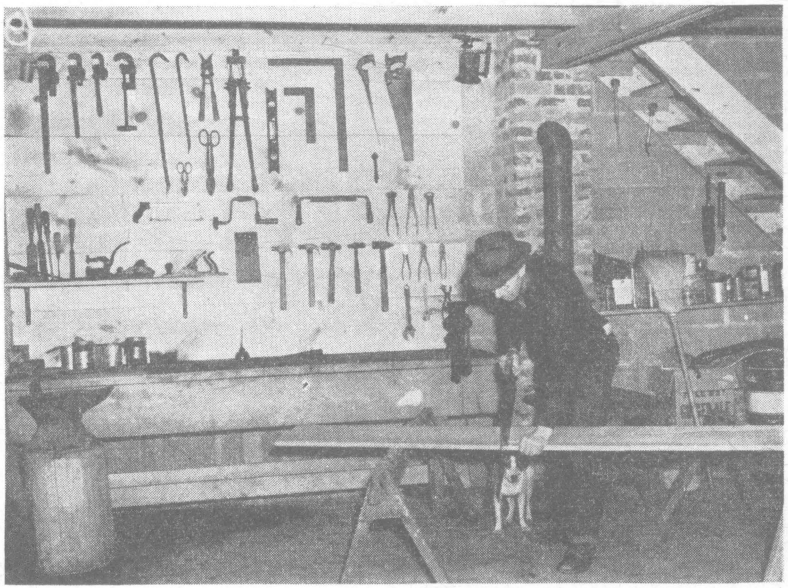


Fig. 13. — This picture shows the shop area of Mr. Kientz's shop. The tool board is located over the work bench. This arrangement is desirable in that the tools are handy and easy to find when wanted. The stove supplies sufficient heat on cold days. The lumber and other supplies are stored overhead. The steps make this storage area accessible and take up very little room.

tools for working metal are *very* essential. These should include tools for overhauling and repairing machines, the necessary tools for working sheet metal, and tools for shaping, threading, and drilling.

A few essential forge tools should be available if the shop has a forge. There are a good many general tools needed in every farm shop. These can be obtained as the need arises for them on a particular farm.

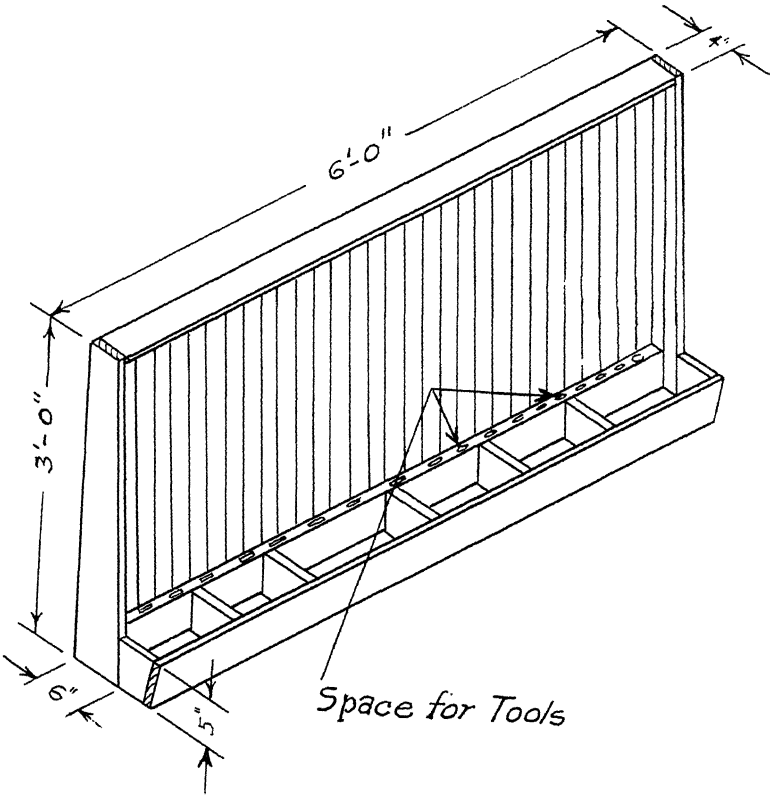


Fig. 14. — What a satisfaction it is to know just where every tool is when you want it! That satisfaction is possible of attainment when a tool board is back of the work bench. (Fig. 15 shows this board with the tools in place.)

Bolts, nuts, screws, washers, nails are at fingers' ends if kept in the small box divisions at the base of the board.

Tool Cabinet or Board

Next to the work bench in importance, in the way of shop equipment, is a tool cabinet or a tool board for storing the tools. A good cabinet can be easily and cheaply made. Its chief advantage is that

it can be closed and locked when not in use, although it is rather unhandy to have to unlock the tool cabinet every time a tool is wanted. Tools are mounted on the inside of the back and also on the doors.

If it is not desirable or necessary to keep the tools in a locked container, the open tool board is a very satisfactory way of storing them. The open board encourages one to keep the tools in their place and they are easily found when wanted. Every tool has a place and looks out of place if hung anywhere else. The cover page shows a

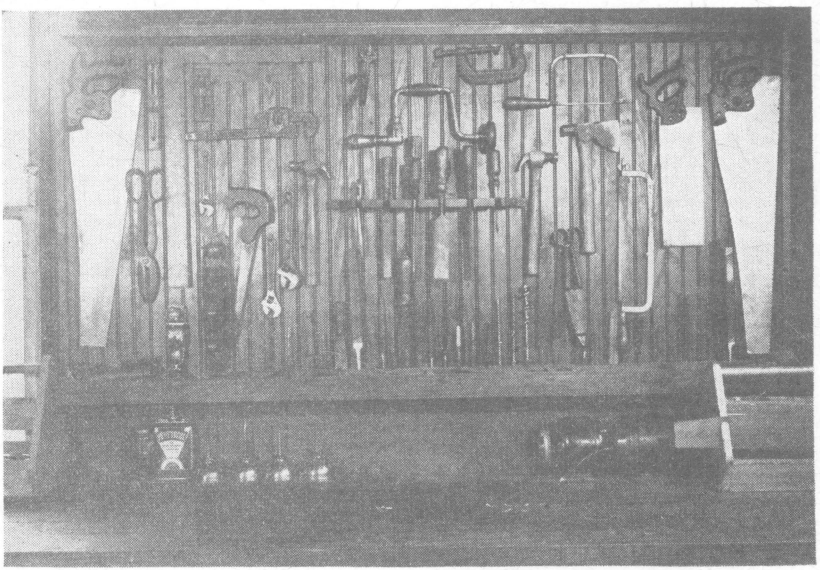


Fig. 15. — This tool board over the work bench affords a place for every tool, and the tools are convenient to the workman. A job is not completed until the tools are back in their places. If a job is to be done away from the shop, the tools are placed in the carrying box and taken to the job, used, and returned to the tool board. Cost of tools mounted on board, about $36.00.

good work bench and an open tool board. This tool board has a nail, screw, or bolt tray along the bottom which is very handy. Figure 14 gives directions for the construction of a tool board, and Figure 15 illustrates how the tools may be mounted.

Tool Carrying Box

It is very convenient to have a tool carrying box in which the tools are placed when they are used away from the shop, but when

they are returned they should be rehung on the tool board. Nails, staples, screws, or bolts can be carried in the tray of the box and are handy for use wherever needed; the tools are carried in the lower part of the box (see Fig. 16).

BILL OF MATERIALS FOR TOOL AND NAIL BOX

Pieces	Use	Dimensions
2	Ends	¾″ x 10″ x 12″
1	Bottom	¾″ x 6⅛″ x 20½″
2	Sides of tool box	¾″ x 3⅝″ x 20½″
2	Sides of tray	½″ x 3″ x 20½″
1	Bottom of tray	½″ x 2⅜″ x 20½″
3	Partitions of tray	½″ x 2⅜″ x 3⅝″ x 1¼″
1	Handle	⅞″ D. x 21″

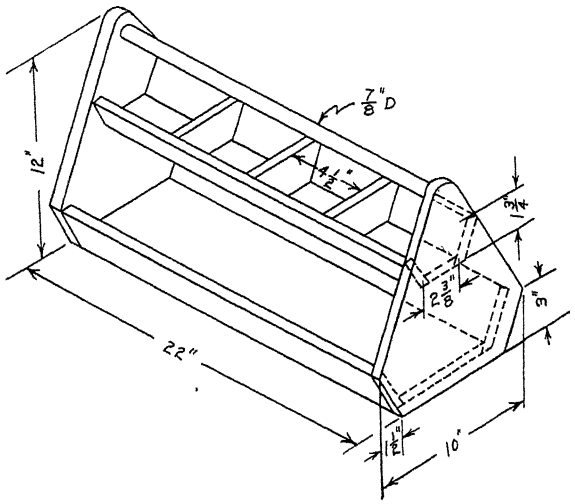


Fig. 16. — All the tools, bolts, nuts, screws, and nails for a repair job to be done outside the farm shop can be moved in a tool carrying box such as the one sketched above.

TOOL GRINDER

It is a question of needs and individual ability as to whether the farm shop should contain any power equipment even where electricity is available. Some power equipment, if used often enough, will soon pay for itself in labor saved. There is no way of hiring cheaper labor than through power equipment on the farm, provided

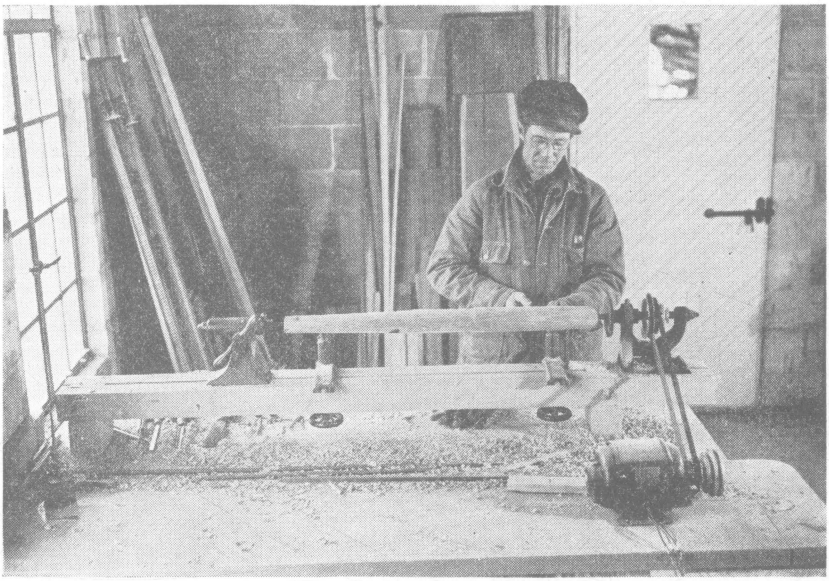


Fig. 17. — Many uses will be found for a turning lathe in a farm shop. Here, a farmer is turning out a neck yoke.

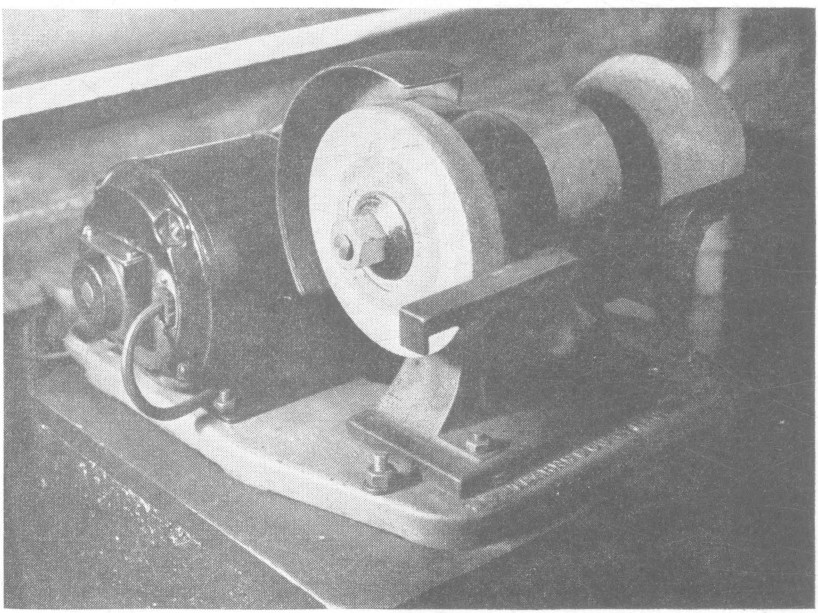


Fig. 18. — This farm grinder, with motor, grinding wheels, and wire and cloth buffers, can be purchased for about $25. It is a real labor saver, and a piece of shop equipment that will be used throughout the year.

that equipment is properly operated and cared for. There is no doubt of the efficiency of the power driven tool grinder. Every farm should have this type grinder even if it does not have a shop. The most desirable power grinder is the one with the motor behind or under the wheel shaft. This clears the wheels for the grinding of long tools such as the scythe or mowing machine knife.

A little more care is necessary in grinding on a carborundum wheel than a sandstone, but with a little care its efficiency is much greater.

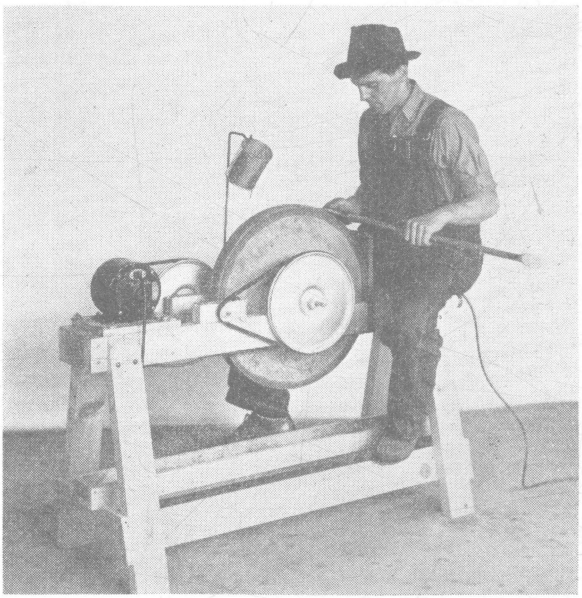


Fig. 19. — A home made tool grinder designed by L. M. Roehl, professor of farm shop work at Cornell University, Ithaca, N. Y. This grinder can be constructed at little cost and is very efficient.

Drills

In our machinery repair and building construction work we have many jobs that require drilling holes in metal. A chain drill can be used for this, but a post or portable electric drill is most satisfactory. A post drill is now on the market at a very low cost, that has a grooved balance wheel for a V-belt; it is driven with a small motor.

By obtaining a used motor the shop can be equipped with a power drill at a very low cost.

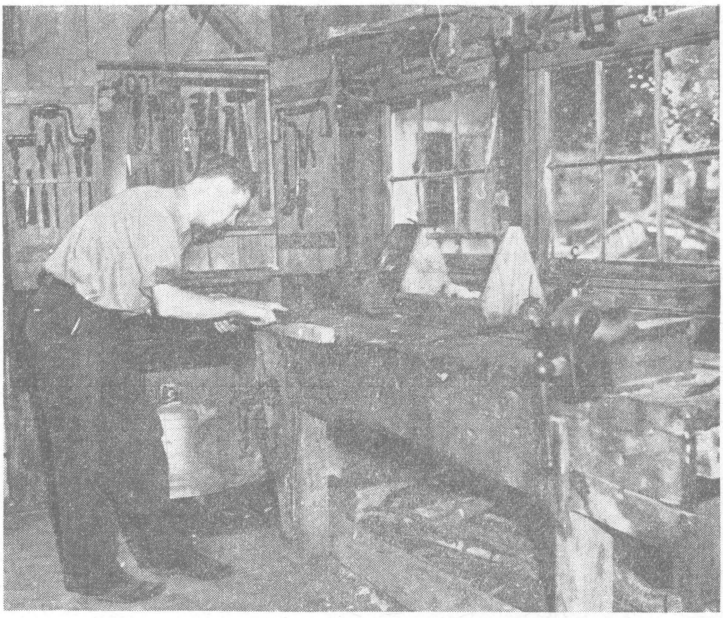


Fig. 20. — William Goldsmith, Westerville, Ohio, says, "A farm without a shop is not a complete farm." This shop has a "waiting list" of repair work throughout most of the year.

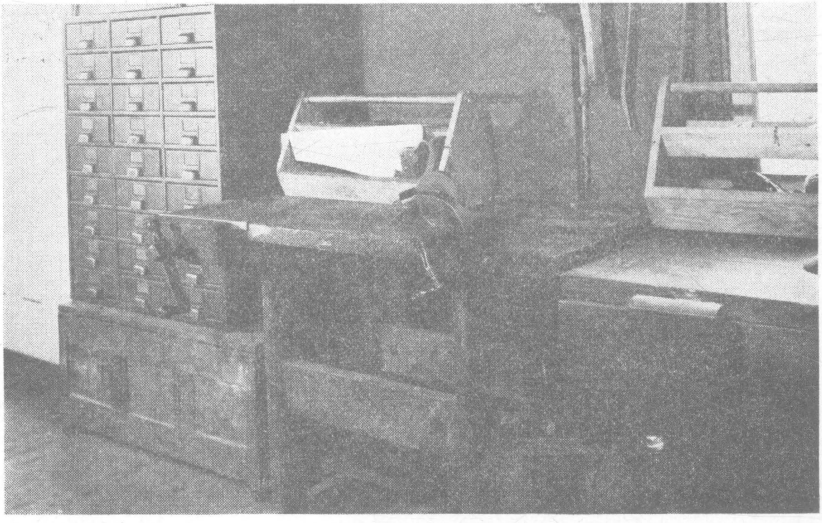


Fig. 21. — A cabinet of this type with spaces for labeling the contents of the drawers is a luxury in a shop from a use standpoint. It can be purchased for about 30 cents a drawer. When we consider use over a long period of time, the cost of such a convenience in a shop is low.

Power Saw

Next in order of importance in most farm shops would be the combination cross-cut and rip saw. This saw can be used to great advantage in a shop for reducing stock lumber to desirable lengths and widths.

Forge and Anvil

The forge is almost a necessity if much metal work is to be done. An inexpensive portable or a built-in forge is sufficient for almost all

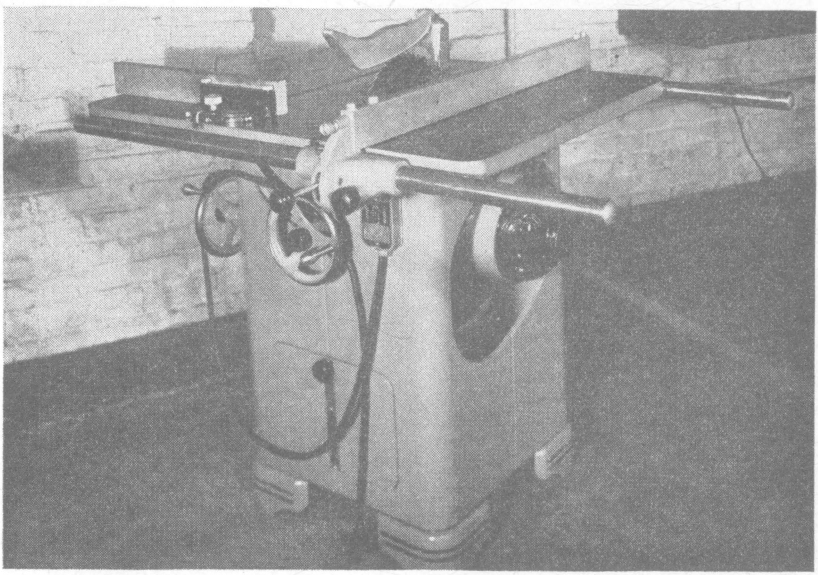


Fig. 22. — A very good combination cross-cut and rip saw. For the farmer who does all of his own carpentry and repair work, this saw would save much hand labor. Rough home-sawed lumber can be reduced to desirable sizes. The average farm shop would not need equipment of this kind, but it is very efficient where its use justifies the purchase.

jobs encountered in farm work. The fundamental practices of forge work are not so difficult to learn but what the average person can become fairly efficient with but a little practice. These fundamental practices consist mostly of bending, straightening, drawing metal into thinner and longer pieces, upsetting metal into thicker and shorter pieces, twisting, and punching.

An anvil of some sort is a necessity if forge work is to be done in the shop.

Fig. 23. — An interior view of the farm shop of Mr. W. D. Kahler, near Westerville. This shop is located in one end of the machinery storage shed.

Other Shop Equipment

The farm shop should be equipped with the necessary tools and equipment needed to maintain farm machinery and other farm equipment in good repair and adjustment. Such tools would be those needed for removing worn and broken parts of farm machinery. Also tools needed for repairing and adjusting farm machinery in order to keep it in good operating condition.

A cabinet should be provided for the storage of nails, bolts, screws, and other small hardware that is often needed for new construction or repair work. Facilities and equipment for protecting tools and machinery from rust should be provided.

Equipment and materials needed for cleaning and painting farm machinery should be on hand so that they will be available when needed. Red lead is an excellent paint for the priming coat on all metal work as it has an active affinity for metal.

A paint sprayer is a useful piece of shop equipment for applying paint to farm machinery and for other general paint jobs. An air compressor with a paint sprayer attachment makes a satisfactory spray outfit.

General Tools Recommended for the Farm Shop

The following is a list of tools needed most in the average farm shop. Recommended size, description, quality, and in some cases make or its equivalent are given as a guide to assist in the purchase of satisfactory tools. Prices are indicated to assist in judging what tools cost. These prices vary to quite an extent. However, quality tools are fairly standard in price.

An attempt is not made here to list all the tools that could be used in the shop. Neither is it necessary to have all the tools listed. A few tools well selected and cared for are more useful than many poor quality tools scattered about the farm and poorly cared for.

WOOD-WORKING TOOLS

Name of tool	Size and description	Recommended quality or equivalent	Price
Cross cut saw	26 in.-8 pt.	Diston D-8 or Atkins No. 65	$3.12
Rip saw	26 in.-5½ pt.	Diston D-8 or Atkins No. 65	3.12
Jack plane	14 in.-2 in. cutter	Stanley No. 5C	3.50
Draw knife	10-inch	No. 600	1.47
Try square	8-inch	Stanley No. 20	.69
Mallet	2½ x 3 x 5 inches	Barrel shaped	.45
Saw set	Pistol grip	Stanley No. 42	1.84
Set auger bits	Set of 13	Irwin Bluwin	7.00
Brace	12-inch ratchet	No. 915	3.68
2 Screwdrivers	6 and 8 inch	No. 20	1.04
Countersink	⅝-inch	Rose	.27
Framing square	Blued	Stanley No. 3RB	2.31
Pair pliers	6-inch Thin nose	Crescent No. 126	.40
Flat file	10-inch Mill bastard		.26
Triangular file	Regular—6 inch		.16
Triangular file	Slim taper—6 inch		.15
Half round wood file	10-inch		.64
Whet stone	Carborundum—1 x 2 x 8 inches	Combination	1.47
Claw hammer	16 oz.	No. 15 Curved claw	1.26
Hatchet	3½-inch	Stanley half	1.25
Carpenter's level	24-inch	Hardwood	3.34
Nail set	Size 2		.10
Putty knife	Elastic blade	No. 5 A-E	.35
4 Wood chisels	¼, ½, ¾, 1 inch	No. R40 Everlast'g	5.04
Ruler	½ x 6 inches	Push pull	.75
Wrecking bar	¾ x 24 inches		.56
	Total		$44.22

Name of tool	Size and description	Price
2 Cold chisels	½ in., ¾ in.	$ .62
2 Punches	½ in. x 5 in.	.44
Bit stock drills	No. 114, 1/16-⅜ in. by 16 ths.	1.42
Hack saw	No. 99	.75
2 Wrenches	Crescent 6 in., 10 in.	1.17
2 Pipe wrenches	12 in., 18 in.	2.74
Soldering copper	1½ No. pair	.67
Tinners' snips	3-inch	2.10
Blacksmith hammer	2 lb.	.82
Blacksmith tongs	11C and 11F	2.22
Bolt tongs	12A and 12D	2.29
Blow torch	1 qt.	4.85
	Total	$20.09
	Total cost of Wood- and Metal-working Tools	$64.31

Fig. 24. — Another garage-shop combination. One side is used for the car and the other is equipped with work bench, tool board, tools, and other shop equipment.